

The Level Of Community Ecological Intelligence And Local Environmental Conditions On The Incidence Of Dengue Hemorrhagic Fever In Tenayan Raya District Pekanbaru City

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Abstract. This study aims to prove the influence of community ecological intelligence and environmental conditions on the incidence of Dengue Hemorrhagic Fever. The recapitulation of the Riau Health Office shows that all areas in Riau are endemic for DHF. Of the 12 districts/cities, the second-highest dengue case was in Pekanbaru City, precisely in Tenayan Raya District. The research method used a case-control design in Tenayan Raya District, Pekanbaru City. The sample consisted of 77 cases and 77 controls. The measuring tools used are questionnaires and observation sheets—data analysis for bivariate with Chi-Square test and multivariate with Multiple Logistics Regression test. The results showed that the dominant ecological intelligence factor associated with the incidence of DHF was the skill variable with mOR value = 80,968 (95% CI: 12,01-545), and the dominant local environmental condition factor associated with the incidence of DHF was house layout with mOR value = 20,453 (95% CI: 8,8-47,5). It is hoped that the community can do community service once a week to maintain the house's cleanliness and the environment.

Keywords. Dengue Hemorrhagic Fever, Ecological Intelligence, Environment

1 Introduction

Humans are an element of the environment. Given the ownership of science, reason, and technology, humans are positioned as one of the most important, even decisive, elements. However, that does not mean that humans can do whatever they want because interference and damage to one element can cause the system as a whole to be disturbed. This is where humans need to have the civility not to damage and harm the environment. Sooner or later, the consequences of human actions will cause humans and other living beings to suffer losses[1]. In order to minimize the losses that occur to humans and other living things, we as humans who have common sense must maintain the ecosystem as a form of symbiotic relationship so as to create a quality living environment.

One of the determining factors so that we can maintain the quality of the living environment is the emergence of significant environmental awareness and healthy individual behavior towards the environment itself [2]. Ecological Intelligence can be formed through both formal and informal education [3]. The main goals of environmental Intelligence are to develop social and ecological responsibility [4],[5] and awareness, critical thinking [6], [7], to pursue

cooperative learning [5], and to bring about behavioral change in the long term. The low level of ecological intelligence in community groups can cause an increase in the number of dengue hemorrhagic fever cases.

Based on the survey results that the authors found in the field in August 2020, that the local environmental conditions in Tenayan Raya District can be classified as unfavorable, here it proves the lack of human civility in acting, or it can be said that ecological intelligence is low. Including the amount of garbage in the gutter, the number of puddles in flower vases, animal drinking. Environmental conditions, as mentioned above, are conditions that cause mosquito breeding and containers, troughs, items around the house that are not well organized, the distance between adjacent houses. nesting. All areas in Riau are endemic for DHF. However, from the number of cases recorded to date, it has not been included in the KLB category. Based on the Riau Provincial Health Office data, it was recorded that 3,375 people had contracted dengue hemorrhagic fever (DHF) during 2019, a sharp increase compared to 2018, which was only 925 cases. To determine an area as an outbreak of dengue fever, the recorded cases must be 51 cases per 100 thousand residents who live. Meanwhile, for the province of Riau itself, there are currently 50 cases of dengue fever per 100,000 residents. The 12 districts/cities, the highest dengue cases were in Bengkalis with 947 people, with nine people dying, followed by Pekanbaru with 417 cases of dengue fever. If we look at the points of DHF and the number of deaths due to DHF for three consecutive years, Pekanbaru City is high. Based on data from the Riau Provincial Health Office, the number of cases spread in several sub-districts including Sukajadi District 16 cases, Senapelan 15 cases, Pekanbaru City 7 cases, Rumbai Pesisir 18 cases, Rumbai 26 cases, Fifty 33 cases, Sail 5 issues, Bukit Raya 47 cases, Marpoyan Damai 56 cases, Tenayan Raya 77 cases, Handsome 68 instances, and Payung Sekaki 49 cases [8]. Based on the data that has been described above, it is one of the reasons the author conducts research so that he can find out the cause of the high number of dengue cases in Tenayan Raya District than other districts in Pekanbaru city.

In addition, several studies have stated a relationship between the environment and the incidence of DHF, and there is a relationship between the presence of TPA and the incidence of DHF [9], [10]. Based on several studies that have been read, there has been no research linking ecological Intelligence with the incidence of DHF, which in some facts, I have known there are several links. For this reason, it is necessary to carry out further studies so that this research can add scientific references and prove the relationship between the level of ecological Intelligence of the community and local environmental conditions to the incidence of Dengue Hemorrhagic Fever in Tenayan Raya District, Pekanbaru City.

2 Research Methods

This research uses a quantitative analytic observational method with case and control design conducted in April-June in Tenayan Raya District, Pekanbaru City. The number of samples in this study was 154 consisting of 77 cases and 77 controls with a ratio of cases and controls 1:1. The types of data collected are primary data and secondary data. The secondary data were cases of DHF taken from medical records at the Tenayan Raya Sub-district Health Center, while the control was a random community in Tenayan Raya District. Primary data collection was done by distributing questionnaires and direct observation to the field. For cases of DHF, an inspection of the presence of mosquito larvae is carried out by observing the TPA see firsthand the presence or absence of mosquito larvae. As for control, they are only distributing questionnaires using google forms, given the limited time and circumstances during this pandemic. Bivariate analysis was performed by chi-square test and multiple logistic regression test with a predictive model for multivariate analysis.

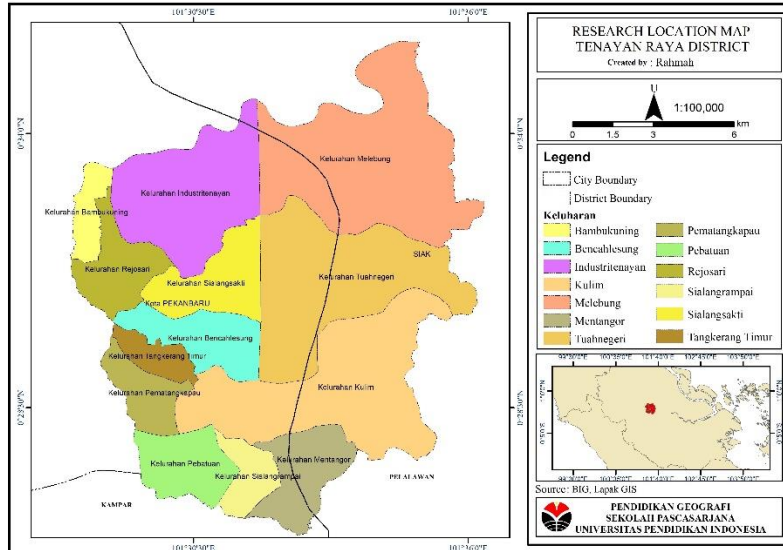


Fig 1. Research Location Map

3 Results and Discussion

The results of bivariate analysis on 4 variables of environmental intelligence factors, all variables have a significant relationship with the incidence of DHF, namely know the impact we cause (p value= 0,000), share knowledge with others (p value= 0,000), skills in environmental conservation (p value= 0,000), involvement in various environmental activities (p value= 0,000). Based on the mOR value, the probability that people infected with DHF knows the impacts are 42.462 times lower than people who are not infected with DHF. People infected with DHF have an attitude of sharing knowledge with others which is 27,328 times lower than those not infected with DHF. People infected with DHF have skills in environmental conservation 67,167 times lower than those not infected with DHF. Communities infected with DHF had 11,083 times lower involvement in various environmental activities than those not infected with DHF (see table 1).

The bivariate analysis results on 11 variables of environmental conditions. Only one variable that has a significant relationship with the incidence of DHF is the variable of home arrangements (p -value = 0.000). Substantially, the house distance variable (p -value = 0.061), decorative plants p -value = 0.062), and the presence of larvae were considered necessary, so they were included in the multivariate analysis. Based on the mOR value, it is 20 times less likely that people infected with dengue have an organized house than people who are not infected with dengue. People infected with DHF have a house distance of < 5 meters, two times less than those not infected with DHF. People infected with dengue have three times fewer decorative plants than people who are not infected with dengue. There is no significant relationship between the presence of larvae and the incidence of DHF because there are larvae in almost every respondent's house, both cases, and controls so that the data obtained are

homogeneous and the p-value does not exist, as well as water reservoirs, humidity, temperature, rainfall received homogeneous data. so that the p-value does not live (see table 2)

The final result of the conditional multiple logistic regression analysis with the predictive factor model of 3 ecological intelligence variables, namely knowing the impact, skills in environmental conservation, and involvement in various environmental activities, the most dominant variable associated with the incidence of DHF is the skill variable in environmental conservation. with $p = 0.000$ and more = 80.968 (see table 3). House planning variable is a variable that influences the dependent variable because it has a p -value <0.05 and is also the most dominant variable affecting the dependent variable because it has the highest OR value of 20,453 (See table 4).

Table 1. Ecological Intelligence Factors Associated with Dengue Hemorrhagic Fever

Variable	Case = 77 n (%)			Control = 77 n (%)			mOR (95% CI)	P- Value
	High	Medium	Low	High	Medium	Low		
Know the Impact We Cause	8 (10%)	69 (90%)	0 (0%)	65 (84%)	12 (16%)	0 (0%)	42,46 (16,52 - 109,15)	0,000
Share Knowledge with others	3 (4%)	9 (12%)	65 (84%)	68 (88%)	7 (9%)	2 (3%)	27,33 (11,04 - 67,62)	0,000
Skills in Environmental Conservation	0 (0%)	11 (14%)	66 (86%)	45 (58%)	29 (38%)	3 (4%)	67,17 (18,65 - 241,86)	0,000
Involvement in Various Environmental Activities	30 (39%)	43 (56%)	4 (5%)	68 (88%)	9 (12%)	0 (0%)	11,08 (4,86 - 25,29)	0,000

Table 2. Factors of Environmental Conditions Associated with DHF

Variable	Case =77 n (%)	Control =77 n (%)	mOR (95% CI)	p
House Distance	68 (88,3%)	59 (76,6%)	2,305 (0,963 - 5,518)	0,061
Home Arrangements	58 (75,3%)	10 (13%)	20,453 (8,807 - 47,497)	0,000
Home Humidity	77 (100%)	77 (100%)	-	-
Decorative plants	71 (92,2%)	63 (81,8%)	2,630 (0,953 - 7,254)	0,062
Water reservoirs	77 (100%)	77 (100%)	-	-
Water reservoirs are not for daily use	74 (96,1%)	75 (97,4%)	0,658 (0,107 - 4,051)	0,652
Natural Water Shelters	69 (89,6%)	69 (89,6%)	1000 (0,355 - 2,816)	1,000
Presence of Larvae	74 (96,1%)	72 (93,5%)	-	-
Temperature	0 (0%)	0 (0%)	-	-
Humidity	77 (100%)	77 (100%)	-	-

Rainfall	0 (0%)	0 (0%)	-	-
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Table 3. Final Stage Multivariate Modeling of Ecological Intelligence Factors

Independent Variables	B	P-Value	mOR	95% CI
Know the Impact We Cause	3,669	0,001	39,223	4,831 - 318,429
Skills in Environmental Conservation	4,394	0,000	80,968	12,018 - 545,486
Involvement in Various Environmental Activities	4,008	0,002	55,023	4,569 - 662,653

Table 4. Final Stage Multivariate Modeling of Environmental Condition factors

Independent variable	B	P-Value	mOR	95% CI
Home Arrangements	3,018	0,000	20,453	8,807 - 47,497

Discussion

1. The Relationship Between Knowing The Impact Caused With DHF Incidence

Based on the study results, it is known that in the case group, the level of ecological Intelligence, the indicator of understanding the impact, is classified as moderate; as many as 69 respondents (89.6%) and eight respondents (10.4%) are high. No respondents do not know the impact. In the control group, the indicator of understanding the result is high; as many as 65 respondents (84.4%), 12 respondents (15.6%) are moderate, and there are no respondents who do not know the impact. The results of the analysis of the relationship between knowing the effect caused by the incidence of DHF obtained a P-value of $0.000 < 0.05$, which means that there is a difference in the possible risk of contracting DHF in people who know the impact caused by people who do not see the effect. The Matched Odds Ratio (mOR) value of 42.462% means that the possibility of people infected with DHF knowing the impact is 42.462 times lower than people who are not infected with DHF.

This is supported by the statement which stated that there is a significant relationship between the level of knowledge and the incidence of DHF in Banjar Pegok, Sasetan Village, South Denpasar District ($p=0.036 < \alpha 0.05$) [11]. In addition, there was a relationship between knowledge, attitudes, and behavior of the community with the incidence of dengue fever in Medan Sunggal District [12]

2. Relationship Between Share Knowledge With Others With DHF Incidence

Based on the results of the study, it is known that in the case group, the level of ecological Intelligence of share knowledge with other indicators is low, namely 65 respondents (84.4%), and nine respondents (11.7%) moderate, and three respondents (3.9%) high. In the control group, the level of ecological Intelligence of share knowledge with others indicators is high, as many as 68 respondents (88.3%), seven respondents (9.1%) are moderate, and two respondents (2.6%) are low. The analysis of the relationship between share knowledge with others and the incidence of DHF obtained a P-value of $0.000 < 0.05$, which means that there is a difference in the possible risk of contracting DHF in people who share knowledge with others who do not share knowledge. The Matched Odds Ratio (mOR) value of 27.328% means that the possibility of people infected with DHF having an attitude of sharing knowledge with others is 27.328 times lower than people who are not infected with DHF.

Several studies state a relationship between attitudes and the incidence of DHF [13],[14] in a study in Denpasar District saying that a person's perspective will affect behavioral tendencies to act.

3. Relationship Between Skills In Environmental Conservation With DHF Incidence

Based on the study results, it is known that in the group of ecological Intelligence, the skills in environmental conservation indicator is low, namely 66 respondents (85.7%) and 11 respondents (14.3%), and none of them has skills in ecological conservation. In the control group, the level of environmental Intelligence of the skills in ecological conservation indicator is high, namely 45 respondents (58.4%), 29 respondents (37.7%), and three respondents (3.9%) low. The results of the analysis of the relationship between skills in environmental conservation and the incidence of DHF obtained P of $0.000 < 0.05$, which means that there is a difference in the possible risk of contracting DHF in people who have skills in environmental conservation and people who do not have skills in environmental protection. The Matched Odds Ratio (mOR) value of 67.167% means that the possibility of people infected with DHF having skills in environmental conservation is 67,167 times lower than people who are not infected with DHF.

This is supported by the statement which stated that there is a relationship between the health behavior of burying used items with the incidence of dengue fever ($p = 0.043$) [15] and used goods in the home environment such as plastic, rubber, cans, or ceramics that can accommodate or become a place for the environment will become a breeding ground for mosquitoes later [16]

4. Relationship of Involvement In Various Environmental Activities With Def Incidence

Based on the results of the study, it is known that in the case group, the level of ecological intelligence indicators of involvement in various environmental activities is classified as moderate, namely 43 respondents (55.8%) and 30 respondents (39%) high, and four respondents (5.2%) low. In the control group, the level of ecological intelligence indicator of involvement in various environmental activities is high; as many as 68 respondents (88.3%) and nine respondents (11.7%) are moderate, none have various ecological activities. The results of the analysis of the relationship between the participation in various environmental activities with the incidence of DHF obtained a p-value of $0.000 < 0.05$, which means that there is a difference in the possible risk of contracting dengue in people who have involvement in various environmental activities with people who do not have involvement in various environmental activities. The Matched Odds Ratio (mOR) value of 11,083 means that the possibility of people infected with DHF having participation in various environmental activities is 11,083 times lower than people who are not infected with DHF.

A study obtained a probability value of $p = 0.012$ with an alpha value of 0.05. It can be concluded that there is a significant relationship between eradicating mosquito nests and cases of dengue hemorrhagic fever [17]. In addition, the relationship between knowledge and actions to eliminate mosquito nets with the incidence of dengue hemorrhagic fever in Tatelu village obtained a p-value of 0.012 with a significance value of 0.05 so that it can be concluded that there is a relationship between mosquito nest eradication measures and dengue hemorrhagic fever[18].

Local Environmental Conditions

1. Relationship Between House Distance With DHF Incidence

Based on the results of the study, it is known that most of the respondents' houses are 5 meters apart from other houses, with details in the case group 68 houses (88.3%) 5 meters, nine houses (11.7%) > 5 meters. While in the control group 59 houses (76.6%) 5 meters, 18 houses

(23.4%) > 5 meters. The results of the analysis of the distance between houses and the incidence of DHF obtained a p-value of $0.061 > 0.05$, which means that there is no difference in the possible risk of contracting DHF in people who have a house distance of < 5 meters and those with a house distance of > 5 meters. The Matched Odds Ratio (mOR) value of 2.3 means that the possibility of people infected with DHF having a house distance of < 5 meters is 2.3 times less than people who are not infected with DHF. This study is by the theory which states that the closer the distance between houses, the easier it is for mosquitoes to spread to the next home [16]. Most of the respondents' houses are not arranged, such as hanging cloth, scattered used goods, and so on, this causes many places for mosquitoes to nest.

2. Relationship Between Home Arrangements With DHF Incidence

Based on the study results, it was known that in the control group, most of the houses were not well organized, with details of 58 (75.3%) and 19 (24.7%) of the respondents' homes being well organized. Most of the houses were well organized in the control group, with details of 67 (87%) respondents' places being well organized and 10 (13%) respondents' homes not being well organized. The analysis of house layout with the incidence of DHF obtained a p-value of $0.000 < 0.05$, which means that there is a difference in the possible risk of contracting DHF in people whose houses are arranged and those who are not. The Matched Odds Ratio (mOR) value of 20.453 means that the possibility of people infected with DHF having an organized house is 20,453 times less than people who are not infected with DHF. Most of the respondents' homes are not arranged, such as hanging cloth, scattered used goods, and so on, this causes many places for mosquitoes to nest. Refers to a study that says that the habit of hanging clothes is a favorite place for mosquitoes to rest while waiting for the time to lay their eggs, and the site is dark, damp, and a little windy. The *Aedes Aegypti* mosquito usually lands on hanging clothes and other objects in the house[19].

3. Relationship Between House Humidity With DHF Incidence

After measuring the humidity in the respondent's houses, both cases of 77 places (100%) and control of 77 homes (100%), it was found that the humidity of all respondents' houses was >60%. There is no significant relationship between house humidity and the incidence of Dengue Hemorrhagic Fever because the humidity measurement results at the time of the study were found to be >60% in both the case and control groups data obtained were homogeneous, and there was no p-value. Also supported by the statement which stated that *Ae. aegypti* mosquitoes at humidity <60% had a short lifespan, could not become vectors, not enough time for virus transfer from the stomach to the salivary glands [19]. So, in general, the humidity of the respondent's house supports the life of the *Aedes Aegypti* mosquito.

4. Relationship Of Decorative Plants With DHF Incidence

The study results illustrate that most of the respondent's houses, both cases, and controls, have decorative plants in and in their yards, with details of 71 (92.2%) case respondents' houses having ornamental plants, and 6 (7.8%) not having decorative plants. In the control respondents, 63 (81.8%) of the respondents' houses had decorative plants, and 14 (18.2%) did not have ornamental plants. The results of the analysis of decorative plants with the incidence of DHF obtained a p-value of $0.062 > 0.05$, which means that there is no difference in the possible risk of contracting DHF in people who have decorative plants and those who do not have ornamental plants. The Matched Odds Ratio (mOR) value of 2,6 means that the possibility of people infected with DHF having decorative plants is 2,6 times less than people who are not infected with DHF.

The bivariate analysis results in a study showed a relationship between the presence of vegetation ($p: 0.002$). The variable presence of vegetation is a risk factor for the incidence of DHF in this study (OR: 6.017 and CI: 1.98 -18.25), which means that the presence of vegetation inside and outside the house has six times the risk of getting DHF than those who do not have greenery inside or outside the house[20]. This is in line with a research that there is a relationship between the presence of plants around the house and the incidence of DHF in East Purwokerto District with a p-value of 0.016 OR = 2.667 (95% CI: 1.2-5.9) [21]

5. Relationship Between Water Reservoir With DHF Incidence

Based on the data that the authors found in the field, it was found that each respondent's house had a water reservoir. There is no significant relationship between water reservoirs and dengue hemorrhagic fever incidence because almost every respondent's home, both cases, and controls, has a water reservoir. The data obtained are homogeneous, and there is no p-value. The Matched Odds Ratio (mOR) value of 1,000 means that the possibility of people infected with dengue fever having a water reservoir is less than one time compared to people who are not infected with dengue. This statement is supported by research which states that the *Ae. Aegypti* can thrive in all types of water, both clean and polluted water[22].

6. The Relationship Between The Water Reservoir Not For Daily Needs With DHF Incidence

Based on the results of the study, both case and control groups mostly had water reservoirs, not for daily use, with details of 74 (96.1%) case respondents' houses having water reservoirs, not for everyday use, and only 3 (3.9 %) houses that do not have a water reservoir, not for daily use. There are 75 (97.4%) water reservoirs that are not for everyday use in the control respondent's house, and only 2 (2.6%) houses do not have a water reservoir, not for daily use. The results of the analysis of water reservoirs not for everyday use with the incidence of dengue fever obtained a p-value of $0.652 > 0.05$, which means that there is no difference in the possible risk of contracting dengue fever in people who have water reservoirs, not for daily use and those who do not have a shelter. Water storage is not for everyday use. The Matched Odds Ratio (mOR) value of 0.658 means that the possibility of people infected with DHF having a water reservoir, not for daily needs is 0.658 times less than people who are not infected with DHF. The results of this study are by the theory which says that used cans, used tires, and plastic can make a significant contribution to the increase in mosquito larvae which automatically opens up opportunities for dengue fever; used car tires are a major breeding ground for *Ae. Aegypti* [23].

7. The Relationship Of Natural Water Reservoirs With DHF Incidence

Most of the case and control respondent's houses have natural water reservoirs with details as many as 69 (89.6%) case and control houses there are natural water reservoirs. Only 8 (10.4%) of the case and control house respondents did not have a natural water reservoir. There is no significant relationship between natural water reservoirs and dengue hemorrhagic fever incidence because there are natural water reservoirs in almost every respondent's house, both cases and controls. The data obtained is homogeneous, and the p-value does not exist. The Matched Odds Ratio (mOR) value of 1,000 means that the possibility of people infected with dengue fever has one times more natural water reservoirs compared to people who are not infected with dengue. This study is directly proportional to the research in 2007, which said that there was a significant relationship between maintaining good environmental hygiene and the incidence of DHF [24]. In an environment where there are objects that can become nesting places for mosquitoes, such as holes in trees, bamboo, coconut shells, and others scattered around, mosquito breeding places and mosquitoes will increase.

8. The Relationship Between The Presence Of Larvae With DHF Incidence

Based on the study results, there were mosquito larvae in most of the respondent's houses, both cases, and controls, with details of 74 (96.1%) case respondents' houses having larvae, and 3 (3.9%) case respondents' homes not having larvae. 72 (93.5%) of the control respondent's house had larvae, and 6 (7.8%) of the control respondent's house had no larvae. The analysis of the presence of larvae with the incidence of DHF obtained a p-value of $1,000 > 0.05$. There was no significant relationship between the presence of larvae and the incidence of Dengue Hemorrhagic Fever because there were larvae in almost every respondent's house, both cases, and controls, so the data obtained were homogeneous, and there was no p-value. This research is inversely proportional to the study, which said a possible risk of developing dengue fever in a home environment with larvae and a home environment without larvae[25]. The difference in the results of this study is because respondents both in the case and control groups are both starting to realize the dangers of DHF disease, but have not carried out 3M activities, namely (Draining, Closing, and Hoarding) the existing TPA so that at the time of observation the presence of larvae in the TPA of case and control respondents almost the same.

9. The Relationship Between Temperature With DHF Incidence

There is no significant relationship between temperature and the incidence of Dengue Hemorrhagic Fever because the results of temperature measurements at the time of the study obtained temperatures in the range of 33°C - 34°C both in the case group and the control group so that the data obtained were homogeneous and there was no p-value. The results of this study are consistent with the theory, which said that the average optimum temperature for mosquito growth is 25°C - 27°C . Mosquito growth will stop altogether when the temperature is less than 10°C or more than 40°C [16]. It can be concluded that the temperature of the respondent's area does not support the development of the *Aedes aegypti* mosquito.

10. The Relationship Of Humidity With DHF Incidence

There is no significant relationship between humidity and the incidence of Dengue Hemorrhagic Fever because, from the results of humidity measurements at the time of the study, the number $>60\%$ in both the case group and control group, the data obtained were homogeneous so that the data obtained were homogeneous and there was no p-value. In accordance, the research said that the humidity of the air was conducive to the development of *Ae. aegypti* in nature, which is between 60%-80% [26].

11. Relationship Between Rainfall With DHF Incidence

In the respondent's area, both cases and controls, there was no rainfall classified as high; all respondent areas had rain >100 mm, and <300 mm, so that it was classified as moderate rainfall. This does not support the growth of mosquitoes, where mosquitoes grow and develop in the rainy season/in areas with high rainfall. The statement endorses this stated that the increase in the population of *Ae. aegypti* occurred in November-December 2015 when the rain was high. Where the high rainfall, according to BMKG, is rainfall with an average of (300-500 mm)/month. [27].

4 Conclusion

The dominant ecological intelligence factor related to the incidence of DHF is the skills in environmental conservation with a value of mOR= 80,968, meaning those who do not have skills in ecological protection have a 67 times greater risk of contracting DHF compared to those who are not used to hanging clothes and environmental conditions. The dominant local factor associated with the incidence of DHF is the housing arrangement variable with a value of mOR = 20,453 (95% CI: 8.8 - 47.4), meaning that those who have a house that is not well organized have a 20 times greater risk of contracting DHF than those who have a place that is not well organized. With those who have managed homes.

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